CLAIMS

1   1. In an intermediate network device having a plurality of ports for forwarding

2   network messages within a bridged network, a method for efficiently transitioning the

3   ports among a plurality of spanning tree protocol (STP) states, the method comprising the

4   steps of:

5   executing the STP at the intermediate network device so as to elect a root of the

6   bridged network and to assign one of the device's ports to a Root Port Role, one or more

7   of the device's ports to an Alternate Port Role, and one or more of the device's ports to a

8   Designated Port Role;

9   transitioning the ports assigned to the Root Port Role and the Designated Port

10   Role to a forwarding STP state;

11   transitioning the one or more ports assigned to the Alternate Port Role to a dis-

12   carding STP state;

13   receiving a bridge protocol data unit (BPDU) message, the BPDU message having

14   a proposal flag that is asserted; and

15   if the BPDU message was received on the port assigned the Root Port Role, leav-

16   ing the one or more ports assigned to the Designated Port Role in the forwarding STP

17   state, provided that the one or more ports assigned to the Alternate Port Role are in the

18   discarding STP state.

1   2. The method of claim 1 wherein the STP substantially complies with the Insti-

2   tute of Electrical and Electronics Engineers (IEEE) 802.1w Rapid Spanning Tree Proto-

3   col (RSTP) specification standard.

1   3. The method of claim 1 wherein, in response to receiving the BPDU message

2   with the proposal flag asserted, the device does not issue one or more BPDU messages

3   from its ports assigned to the Designated Port Role.

1   4. The method of claim 3 further comprising the step of issuing a BPDU message

2 from the port assigned to the Root Port Role, the issued BPDU message having an

3 agreement flag that is asserted.

1   5. The method of claim 1 further comprising the steps of:

2   transitioning one or more ports assigned to the Designated Port Role to a discard-

3 ing STP state, if the BPDU message with the asserted proposal flag is received on a port

4 other than the port assigned to the Root Port Role; and

5   upon transitioning the one or more ports assigned to the Designated Port Role to

6 the discarding state, issuing a BPDU message from the port on which the BPDU message

7 with the asserted proposal flag was received, the issued BPDU message having an

8 agreement flag that is asserted.

1   6. The method of claim 1 further comprising the step of, if the one or more ports

2 assigned the Alternate Port Role is not in the discarding STP state, placing such ports in

3 the discarding STP state.

1   7. An intermediate network device configured to forward network messages

2 within a bridged network, the device having a plurality of ports for connecting the device

3 to one or more network entities, the intermediate network device comprising:

4   a port role selection state machine configured to assign roles to the ports;

5   a port transition state machine configured to transition the ports among a plurality

6 of spanning tree protocol (STP) states depending on the assigned roles; and

7   a sync manager for use in executing the STP, wherein,

8   the port role selection state machine and the port transition state machine

9 cooperate so as to assign one of the device's ports to a Root Port Role, to assign

10 one or more of the device's ports to an Alternate Port Role, and to assign one or

11 more of the device's ports to a Designated Port Role,

12   the port role selection state machine and the port transition state machine

13 further cooperating to transition the ports assigned to the Root Port Role and the

14   Designated Port Role to a forwarding STP state and to transition the one or more

15   ports assigned to the Alternate port role to a discarding STP state, and

16   in response to receiving a bridge protocol data unit (BPDU) message hav-

17   ing a proposal flag that is asserted, the sync manager cooperates with the port

18   transition state machine to leave one or more of the ports assigned to the Desig-

19   nated Port Role in the forwarding STP state, provided that the BPDU message

20   was received on the port assigned the Root Port Role and further provided that the

21   one or more ports assigned to the Alternate Port Role are in a discarding STP

22   state.

1   8. The intermediate network device of claim 7 further comprising a forwarding

2   engine configured to forward network messages received on a first port to one or more

3   second ports.

1   9. The intermediate network device of claim 7 wherein the STP executed by the

2   device substantially complies with the Institute of Electrical and Electronics Engineers

3   (IEEE) 802.1w Rapid Spanning Tree Protocol (RSTP) specification standard.

1   10. The intermediate network device of claim 7 further comprising a BPDU mes-

2   sage generator, wherein the sync manager cooperates with the BPDU message generator

3   to have a BPDU message issued from the port assigned to the Root Port Role, the issued

4   BPDU message having an agreement flag that is asserted.

1   11. In an intermediate network device having a plurality of ports for forwarding

2   network messages within a bridged network, a method for efficiently transitioning the

3   ports among a plurality of spanning tree protocol (STP) states, the method comprising the

4   steps of:

5   executing the STP at the intermediate network device so as to elect a root of the

6   bridged network, to designate a port of the device to be the current root port and to assign

7   one or more of the device's ports to a Designated Port Role;

8   transitioning the ports assigned to the Designated Port Role to a forwarding STP

9 state;

10   receiving a bridge protocol data unit (BPDU) message, the BPDU message having

11 a proposal flag that is asserted; and

12   if the proposal-BPDU message was received on the current root port, leaving the

13 one or more ports assigned to the Designated Port Role in the forwarding STP state.

1   12. The method of claim 11 further comprising the step of, if the proposal-BPDU

2 message was received on a newly elected root port, identifying the current root port as a

3 previous root port, transitioning the previous root port to a blocking STP state and leav-

4 ing the one or more ports assigned to the Designated Port Role in the forwarding STP

5 state.

1   13. The method of claim 12 further comprising the step of issuing a BPDU mes-

2 sage from the port on which the proposal-BPDU message was received, the issued BPDU

3 message having an agreement flag that is asserted.